

What is claimed is:

1. In a charged-particle-beam (CPB) microlithography method in which a device pattern, to be transferred onto a specific area of a sensitive substrate, is defined on a reticle that is subsequently illuminated with a charged-particle
5 illumination beam to form a patterned beam that is directed at the sensitive substrate so as to imprint a corresponding region of the substrate with the pattern, a method for correcting errors in pattern elements, as imprinted on the substrate, caused by proximity effects, the proximity-effect correction method comprising:

10 in performing a local resizing of a pattern element on the reticle, changing a linewidth of the pattern element, as defined on the reticle, by correspondingly changing an energy dose of an electron beam used to draw the pattern element on the reticle so as to change the linewidth from its initial design value.

2. In a charged-particle-beam (CPB) microlithography method in which
15 a device pattern, to be transferred onto a specific area of a sensitive substrate, is formed on a reticle that is subsequently illuminated with a charged-particle illumination beam to form a patterned beam that is directed at the sensitive substrate so as to imprint a corresponding region of the substrate with the pattern, a method for correcting errors in pattern elements, as imprinted on the substrate, caused by
20 proximity effects, the proximity-effect correction method comprising:

in performing a local resizing of a pattern element on the reticle, changing a linewidth of the pattern element, as defined on the reticle, by correspondingly changing (i) a drawn linewidth of the pattern element, and (ii) an energy dose of an electron beam used to draw the pattern element on the reticle so as to change the
25 linewidth from its initial design value.

3. A method for producing a reticle for use in transferring a pattern, defined by the reticle, from the reticle to a substrate by charged-particle-beam microlithography, the method comprising:

in a design for a reticle pattern comprising pattern elements to be transferred to the substrate, calculating local-resizing corrections to profiles of the pattern elements, to be defined on the reticle, so as to configure the pattern-element profiles for correcting proximity effects that otherwise would be manifest on the pattern elements when projected onto the substrate;

from the calculated corrections, obtaining corrected reticle-pattern data; and

forming the pattern elements on a reticle by drawing the pattern elements using an electron beam that is variably shaped as required to impart respective changes, according to the corrected reticle-pattern data, in a dose of the electron beam on the reticle, the changes in dose imparting corresponding changes in linewidths of the pattern elements, as defined on the reticle, sufficiently to reduce proximity effects acting on the pattern elements when the pattern is transferred to the substrate.

4. The method of claim 3, further comprising the step, when forming the pattern elements on the reticle, of changing the drawn line width of the pattern elements.

5. A method for producing a reticle for use in transferring a pattern, defined by the reticle, from the reticle to a substrate by charged-particle-beam microlithography, the method comprising:

in a design for a reticle pattern comprising pattern elements to be transferred to the substrate, calculating corrections to profiles of the pattern elements, to be defined on the reticle, so as to configure the pattern-element profiles for correcting proximity effects that otherwise would be manifest on the pattern elements when projected onto the substrate;

from the calculated corrections, obtaining corrected reticle-pattern data;

according to the corrected reticle-pattern data, performing local resizing of the pattern elements; and

forming the locally resized pattern elements on a reticle by drawing the pattern elements using an electron beam as required to impart respective changes, according to the corrected reticle-pattern data, in a dose of the electron beam on the reticle, the changes in dose imparting corresponding changes in linewidths of the locally resized pattern elements, as defined on the reticle, sufficiently to reduce proximity effects acting on the pattern elements when the pattern is transferred to the substrate.

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6. The method of claim 5, further comprising the step, when forming the pattern elements on the reticle, of changing the drawn linewidth of the pattern elements.

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7. A reticle, produced according to the method recited in claim 3.

8. A reticle, produced according to the process recited in claim 5.

9. A reticle defining a device pattern to be transferred onto a specific area of a sensitive substrate, comprising:

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a reticle substrate; and

a pattern defined on the reticle substrate, the pattern including a pattern element that is locally resized relative to a design specification for the pattern element, the locally resized pattern element having a linewidth that is corrected so as to reduce a proximity effect that otherwise would occur if the pattern element were exposed onto a sensitive substrate without the corrected linewidth, the linewidth

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being corrected on the reticle by varying a dose of an electron beam used to write the pattern element on the reticle substrate.

10. A reticle defining a device pattern to be transferred onto a specific
5 area of a sensitive substrate, comprising:

a reticle substrate; and

- a pattern defined on the reticle substrate, the pattern including a pattern
element that is locally resized relative to a design specification for the pattern
element, the locally resized pattern element having a linewidth that is corrected so as
10 to reduce a proximity effect that otherwise would occur if the pattern element were
exposed onto a sensitive substrate without the corrected linewidth, the linewidth
being corrected on the reticle by varying a dose of an electron beam used to write
the pattern element on the reticle substrate and by changing the linewidth as drawn
on the reticle substrate.

11. A method for manufacturing a microelectronic device, comprising the
steps of:

providing a reticle as recited in claim 9; and

- microlithographically transferring the pattern, defined on the reticle, to a
20 sensitive substrate using a charged particle beam.

12. A method for manufacturing a microelectronic device, comprising the
steps of:

providing a reticle as recited in claim 10; and

- 25 microlithographically transferring the pattern, defined on the reticle, to a
sensitive substrate using a charged particle beam.